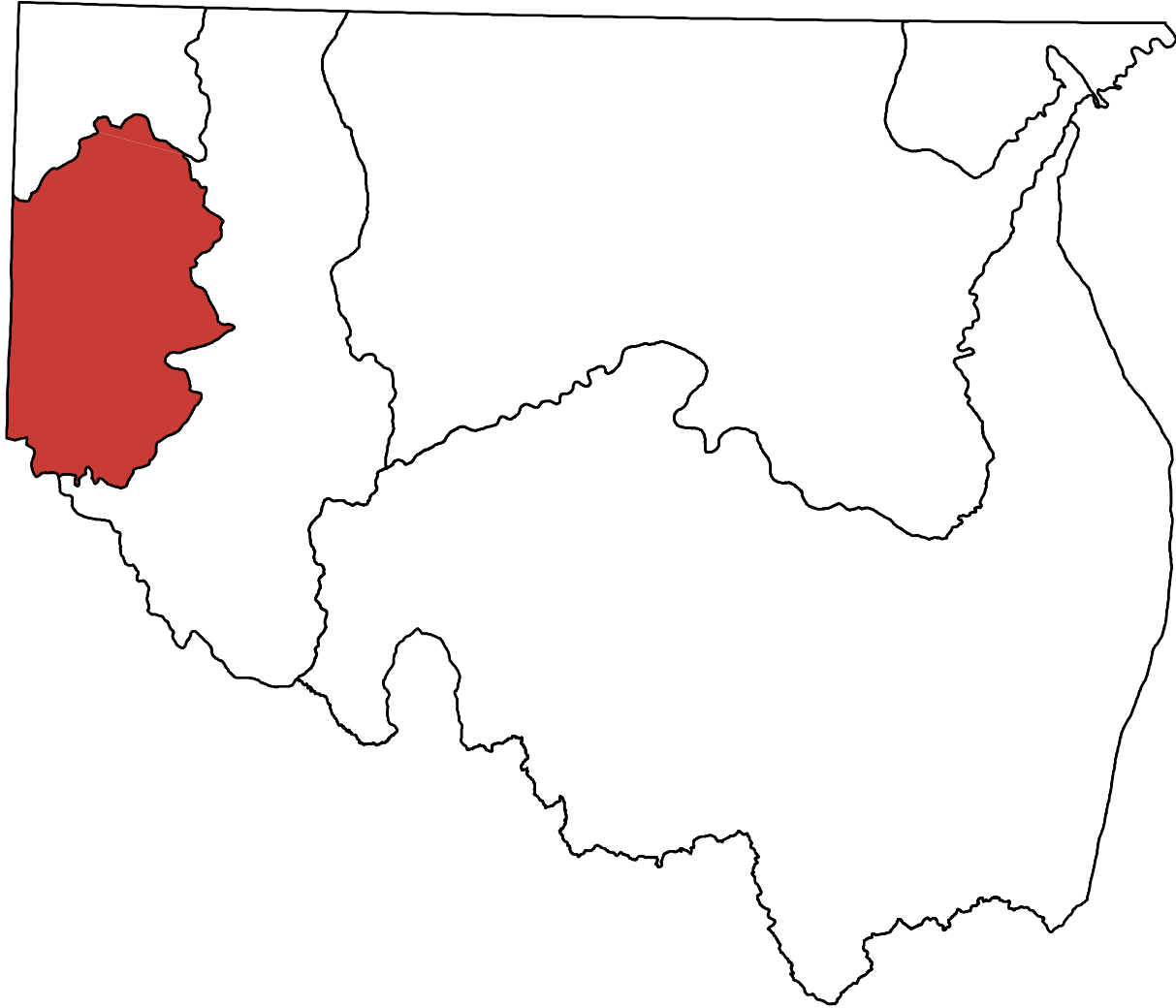


Section 6.2

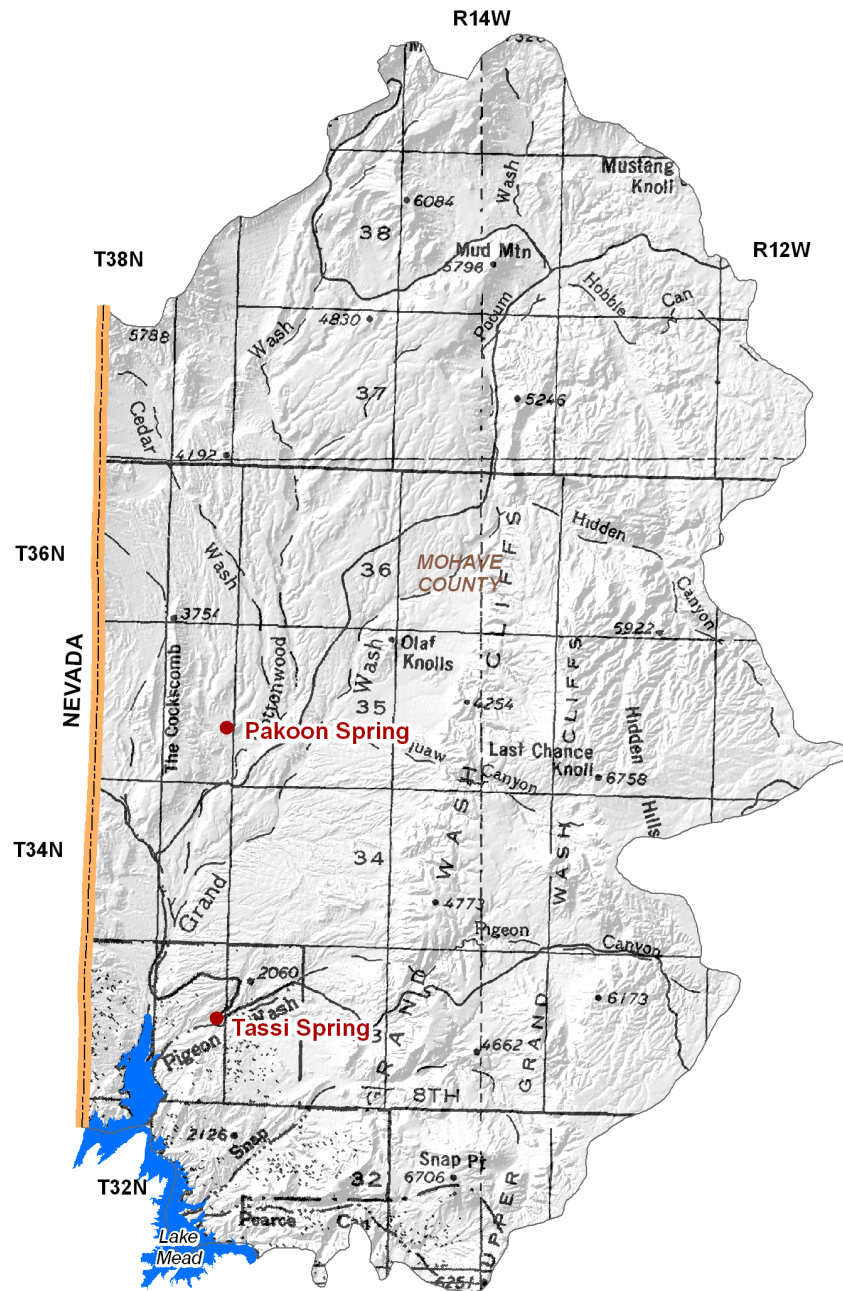
Grand Wash Basin



6.2.1 Geography of the Grand Wash Basin

The Grand Wash Basin, located in the western part of the planning area is 959 square miles in area. Geographic features and principal communities are shown on Figure 6.2-1. The basin is characterized by cliffs and washes. Vegetation is primarily Mohave desertscrub and Great Basin conifer woodland with small areas of Great Basin desertscrub, interior chaparral and plains grassland. (See Figure 6.0-9)

- Principal geographic features shown on Figure 6.2-1 are:
 - Basin places of Pakoon Spring and Tassi Spring
 - Lake Mead forming the southwestern basin boundary
 - Grand Wash in the western portion of the basin
 - Grand Wash and Upper Grand Wash Cliffs running north-south through the basin
 - Mud Mountain in the northern portion of the basin
 - The highest point in the basin, Last Chance Knoll, at 6,758 feet



Base Map: USGS 1:500,000, 1981

0 3 6
Miles



Nevada State Boundary
City, Town or Place



Figure 6.2-1
Grand Wash Basin
Geographic Features

6.2.2 Land Ownership in the Grand Wash Basin

Land ownership, including the percentage of ownership by category, for the Grand Wash Basin is shown in Figure 6.2-2. The principal feature of land ownership in this basin is the large portion of land, 96% of the total basin area, within the Grand Canyon-Parashant National Monument managed by the U.S. Bureau of Land Management and the National Park Service. A description of land ownership data sources and methods is found in Volume 1, Section 1.3.8. Land ownership categories are discussed below in the order of percentage from largest to smallest in the basin.

U.S. Bureau of Land Management (BLM)

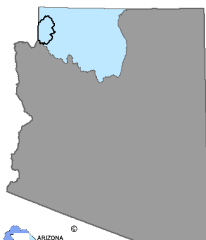
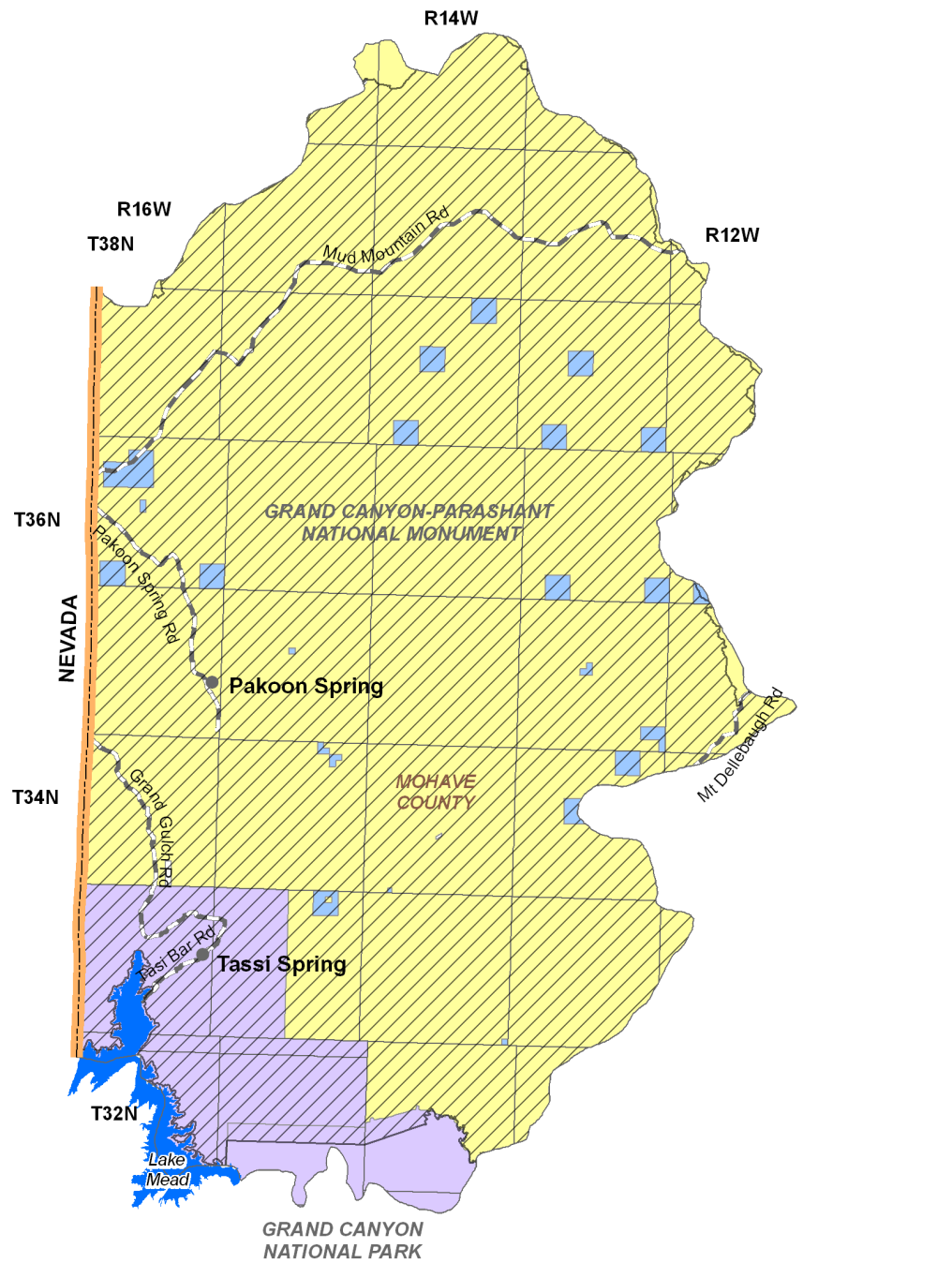
- 86.4% of the land is federally owned and managed by the Arizona Strip Field Office of the Bureau of Land Management.
- Most of the BLM lands in this basin are part of the Grand Canyon-Parashant National Monument, which also includes two wilderness areas, Grand Wash Cliffs (37,030 acres, entire) and Paiute (87,900 acres, portion).
- Land uses include resource conservation, recreation and grazing.

National Park Service (NPS)

- 11.8% of the land is federally owned and managed by the National Park Service as the Grand Canyon-Parashant National Monument and Grand Canyon National Park.
- Land uses include resource conservation and recreation.

State Trust Land

- 1.8% of the land is held in trust for the public schools under the State Trust Land system.
- All state land is interspersed with BLM land and is included within the boundaries of the Grand Canyon-Parashant National Monument.
- Primary land use is grazing.



Source: ALRIS, 2004
Bureau of Land management, 1999 & 2000

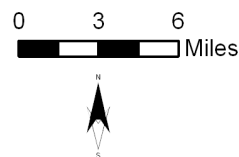


Figure 6.2-2
Grand Wash Basin
Land Ownership

Land Ownership (Percentage in Basin)	
U.S. Bureau of Land Management (86.4%)	
National Park Service (11.8%)	
State Trust (1.8%)	
National Monument	
Nevada State Boundary	
Major Road	
City, Town or Place	

6.2.3 Climate of the Grand Wash Basin

The Grand Wash Basin does not contain NOAA/NWS, Evaporation Pan, AZMET or SNOTEL/Snowcourse stations. Figure 6.2-3 shows precipitation contour data from the Spatial Climate Analysis Service (SCAS) at Oregon State University. A description of the climate data sources and methods is found in Volume 1, Section 1.3.3.

SCAS Precipitation Data

- See Figure 6.2-3
- Average annual rainfall is as high as 16 inches in the northern portion of the basin and four inches or less near Lake Mead.

Table 6.2-1 Climate Data for the Grand Wash Basin

A. NOAA/NWS Co-op Network:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Temperature Range (in F)		Average Precipitation (in inches)				
			Max/Month	Min/Month	Winter	Spring	Summer	Fall	Annual
None									

Source: WRCC, 2003

B. Evaporation Pan:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Avg. Annual Evap (in inches)
None			

Source: WRCC, 2003.

C. AZMET:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Annual Reference Evapotranspiration, in inches (Number of years to calculate averages)
None			

Source: Arizona Meteorological Network, 2005

D. SNOTEL/Snowcourse:

Station Name	Elevation (in feet)	Period of Record Used for Averages	Average Snowpack, at Beginning of the Month, as Inches Snow Water Content (Number of measurements to calculate average)					
			Jan.	Feb.	March	April	May	June
None								

Source: NRCS, 2005

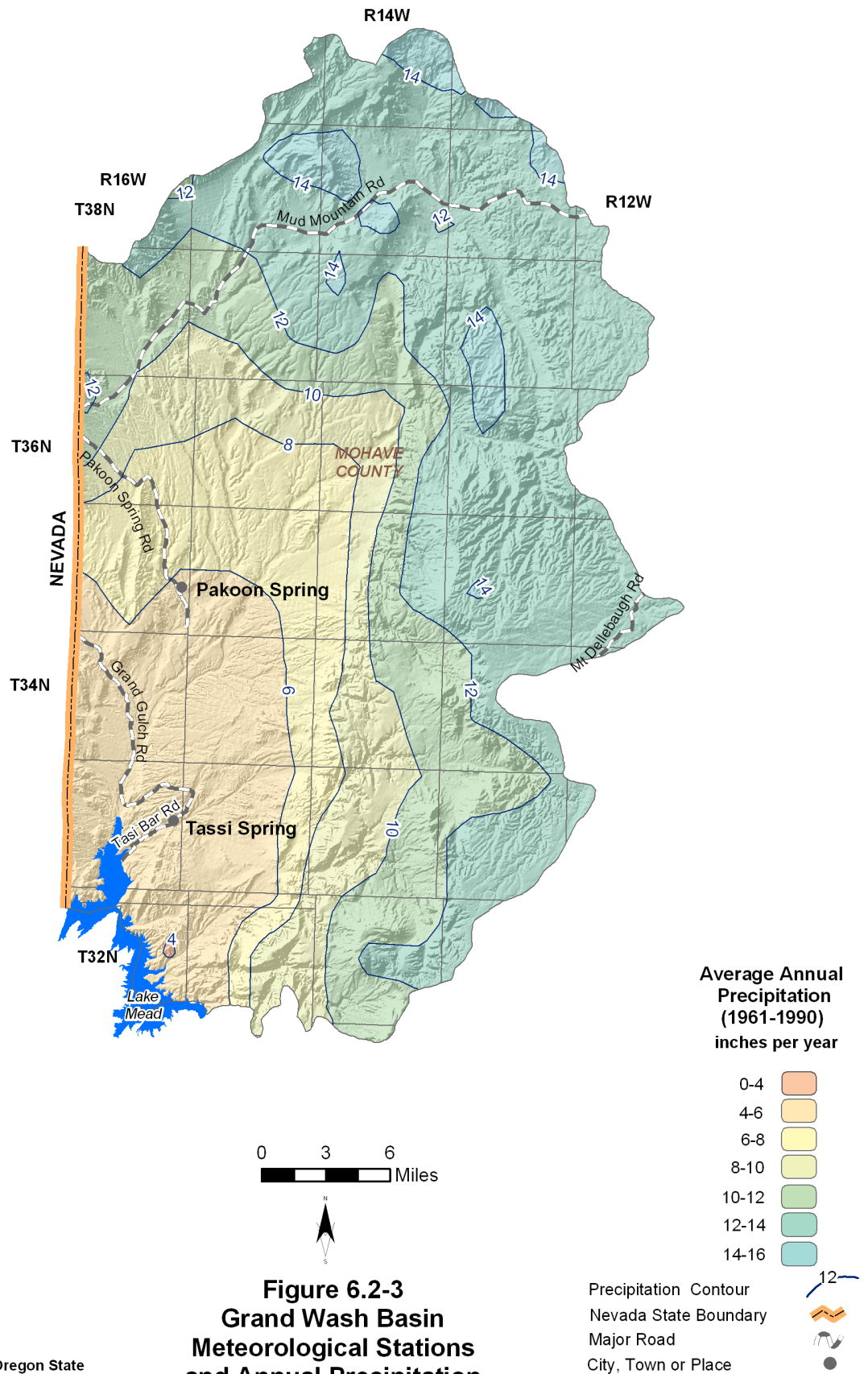


Figure 6.2-3
Grand Wash Basin
Meteorological Stations
and Annual Precipitation



Precipitation Data Source: Oregon State University, 1998

6.2.4 Surface Water Conditions in the Grand Wash Basin

There are no streamflow data, flood ALERT equipment or large reservoirs in this basin. Total number of stockponds in the basin is shown on Table 6.2-4. USGS runoff contours are shown on Figure 6.2-4. A description of stream data sources and methods is found in Volume 1, Section 1.3.16. A description of reservoir data sources and methods is found in Volume 1, Section 1.3.11. A description of stockpond data sources and methods is found in Volume 1, Section 1.3.15.

Reservoirs and Stockponds

- Refer to Table 6.2-4
- There are no large or small reservoirs.
- There are 109 registered stockponds in the basin.

Runoff Contour

- Refer to Figure 6.2-4.
- Average annual runoff is highest, one inch per year or 53 acre-feet per square mile, in the northern portion of the basin near Mud Mountain Road and decreases to 0.1 inches, or five acre-feet per square mile, in most of the southern portion of the basin.

Table 6.2-2 Streamflow Data for the Grand Wash Basin

Station Number	USGS Station Name	Drainage Area (in mi ²)	Mean Basin Elevation (in feet)	Period of Record	Average Seasonal Flow (% of annual flow)				Annual Flow/Year (in acre-feet)				Years of Record
					Winter	Spring	Summer	Fall	Minimum	Median	Mean	Maximum	
None													

Sources: USGS NWIS, USGS 1998 and USGS 2003.

Table 6.2-3 Flood ALERT Equipment in the Grand Wash Basin

Station ID	Station Name	Station Type	Install Date	Responsibility
None				

Table 6.2-4 Reservoirs and Stockponds in the Grand Wash Basin

A. Large Reservoirs (500 acre-feet capacity and greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM STORAGE (AF)	USE	JURISDICTION
None identified by ADWR at this time					

B. Other Large Reservoirs (50 acre surface area or greater)

MAP KEY	RESERVOIR/LAKE NAME (Name of dam, if different)	OWNER/OPERATOR	MAXIMUM SURFACE AREA (acres)	USE	JURISDICTION
None identified by ADWR at this time					

C. Small Reservoirs (greater than 15 acre-feet and less than 500 acre-feet capacity)

Total number: 0

Total maximum storage: 0 acre-feet

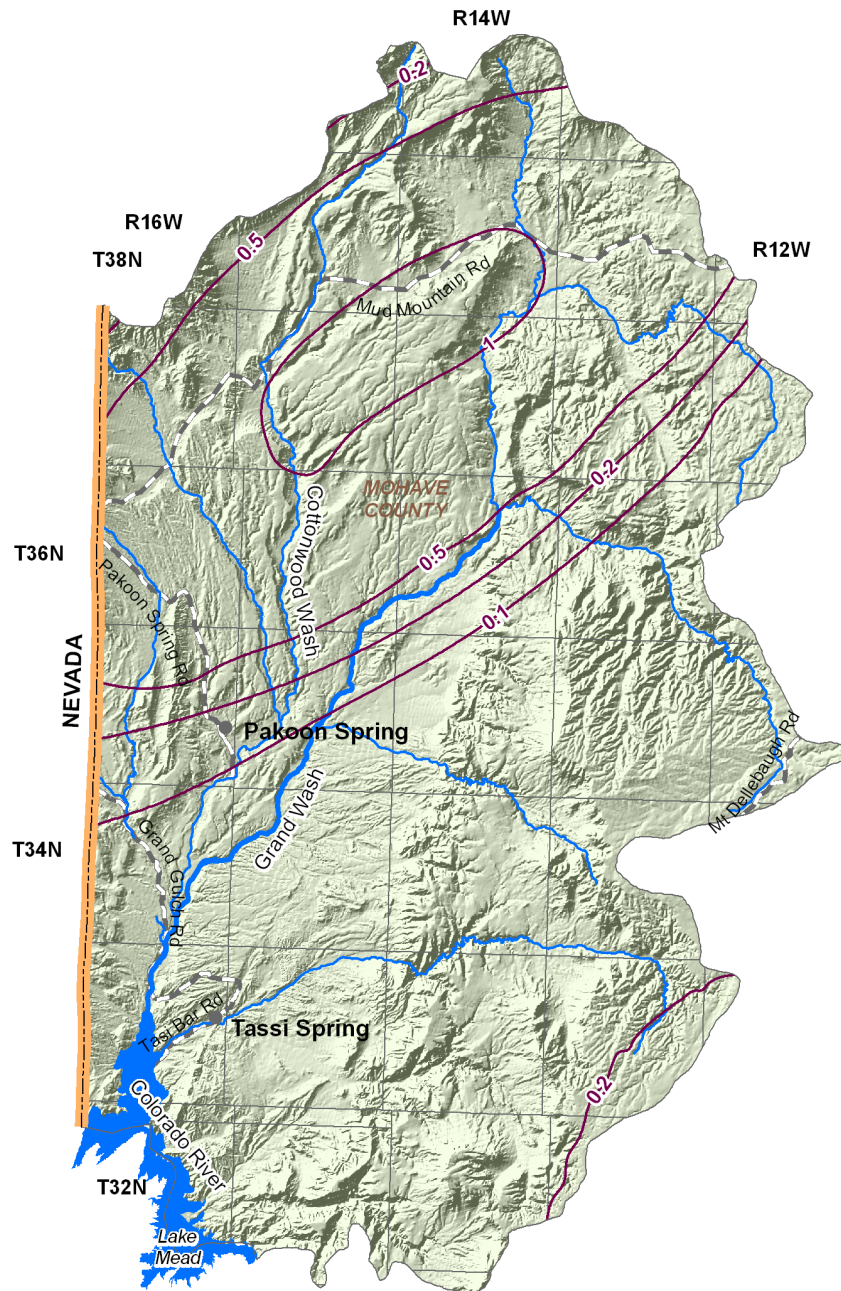
D. Other Small Reservoirs (between 5 and 50 acres surface area)

Total number: 0

Total surface area: 0 acres

E. Stockponds (up to 15 acre-feet capacity)

Total number: 109

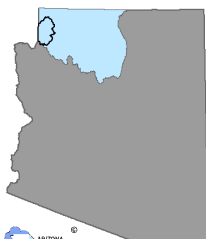


0 3 6
Miles



Figure 6.2-4
Grand Wash Basin
Surface Water Conditions

USGS Annual Runoff Contour
for 1951-1980 (in inches)
Stream Channel (width of line
reflects stream order)
Nevada State Boundary
Major Road
City, Town or Place



Stream Data Source: ALRIS, 2005

6.2.5 Perennial/Intermittent Streams and Major Springs in the Grand Wash Basin

Major and minor springs with discharge rates and date of measurement, and the total number of springs in the basin are shown in Table 6.2-5. The locations of major springs and one perennial stream are shown on Figure 6.2-5. A description of data sources and methods for intermittent and perennial reaches is found in Volume 1, Section 1.3.16. A description of spring data sources and methods is found in Volume 1, Section 1.3.14.

- There are no intermittent streams and the only perennial stream is the Colorado River, which is impounded at Hoover Dam, and forms Lake Mead in this basin.
- There are six major springs with a measured discharge of 10 gallons per minute (gpm) or greater at any time.
- Listed discharge rates may not be indicative of current conditions.
- All springs are located in the western portion of the basin. The greatest discharge rate was measured at Tassi Spring, 75 gpm.
- Springs with measured discharge of 1 to 10 gpm are not mapped but coordinates are given in Table 6.2-5B. There are nine minor springs in this basin.
- The total number of springs, regardless of discharge, identified by the USGS varies from 47 to 52, depending on the database reference.

Table 6.2-5 Springs in the Grand Wash Basin

A. Major Springs (10 gpm or greater):

Map Key	Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
		Latitude	Longitude		
1	Tassi	361523	1135728	75	5/9/2000
2	Pakoon	362457	1135726	58	5/11/2000
3	Whiskey	361848	1135851	40	2/6/1980
4	Chill Heal	361301	1135917	25	3/12/1980
5	Unnamed	361817	1135855	20	2/6/1980
6	Unnamed	361314	1135944	13	3/12/1980

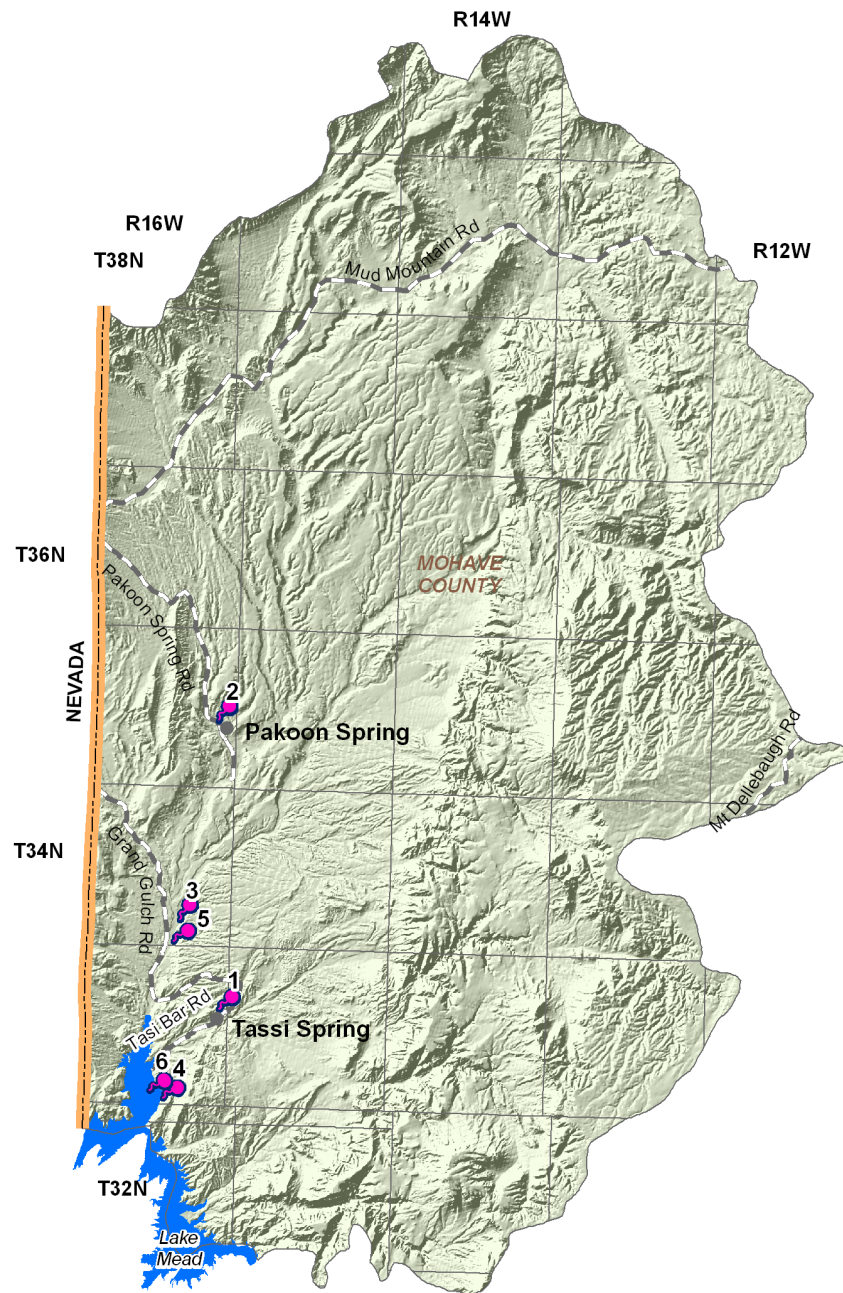
B. Minor Springs (1 to 10 gpm):

Name	Location		Discharge (in gpm) ¹	Date Discharge Measured
	Latitude	Longitude		
Middle	363205	1140230	9	5/11/2000
Burro	361700	1140013	3	5/9/2000
Unnamed	361752	1135906	4	9/22/1976
Cane -south	363916	1134705	2	5/14/2000
Hidden	362812	1133741	2	5/15/2000
Mud	364145	1134644	2	5/13/2000
Unnamed	361544	1135614	2	3/12/1980
Red Rock	363303	1140124	2	5/12/2000
#106	364100	1134526	2	5/13/2000

**C. Total number of springs, regardless of discharge, identified by USGS
(see ALRIS, 2005 and NHD, 2006): 47 to 52**

Notes:

¹ Most recent measurement identified by ADWR



Stream Data Source: AGFD, 1993 & 1997

0 3 6
Miles



Figure 6.2-5
Grand Wash Basin
Perennial/Intermittent Streams
and Major (>10 gpm) Springs

Springs
Perennial Streams
Nevada State Boundary
Major Road
City, Town or Place



6.2.6 Groundwater Conditions of the Grand Wash Basin

Major aquifers, well yields, number of index wells and date of last water-level sweep are shown in Table 6.2-6. Figure 6.2-6 shows water-level change between 1990-1991 and 2003-2004. Figure 6.2-7 contains hydrographs for selected wells shown on Figure 6.2-6. Figure 6.2-8 shows well yield for one well. A description of aquifer data sources and methods is found in Volume 1, Section 1.3.2. A description of well data sources and methods, including water-level changes and well yields, is found in Volume 1, Section 1.3.19.

Major Aquifers

- Refer to Table 6.2-6 and Figure 6.2-6.
- Major aquifers in the basin include recent stream alluvium and sedimentary rock (Cottonwood Wash and Muddy Creek Formations).
- Most of the basin geology consists of consolidated crystalline and sedimentary rock.
- Data on groundwater flow direction is not available for this basin.

Well Yields

- Refer to Table 6.2-6 and Figure 6.2-8.
- As shown on Figure 6.2-8 well yield data are only available for one well, which yields less than 100 gallons per minute (gpm).

Water Level

- Refer to Figure 6.2-6. Water levels are shown for wells measured in 2003-2004.
- The Department annually measures two index wells in this basin. The water level in one well was at a depth of 21 feet and rose by more than 30 feet between 1990-1991 and 2003-2004. Water level in the other well is at a depth of 508 feet and was generally stable between 1990-1991 and 2003-2004.
- Hydrographs corresponding to the two wells found on Figure 6.2-6, but covering a longer time period are shown in Figure 6.2-7.

Table 6.2-6 Groundwater Data for the Grand Wash Basin

Basin Area, in square miles:	959	
Major Aquifer(s):	Name and/or Geologic Units	
	Recent Stream Alluvium	
	Basin Fill with Interbedded Volcanic Rock	
	Sedimentary Rock (Cottonwood Wash Formation)	
	Sedimentary Rock (Muddy Creek Formation)	
Well Yields, in gal/min:	N/A	Measured by ADWR and/or USGS
	10 (1 well reported)	Reported on registration forms for large (> 10-inch) diameter wells
	300	ADWR (1990)
	Range 0-500	USGS (1994)
Estimated Natural Recharge, in acre-feet/year:	N/A	
Estimated Water Currently in Storage, in acre-feet:	N/A	ADWR (1990 and 1994)
	N/A	Arizona Water Commission (1975)
Current Number of Index Wells:	2	
Date of Last Water-level Sweep:	1976 (6 wells measured)	

N/A = Not Available

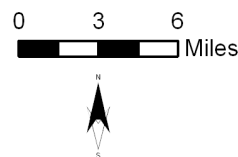
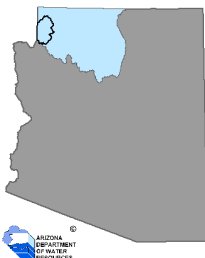
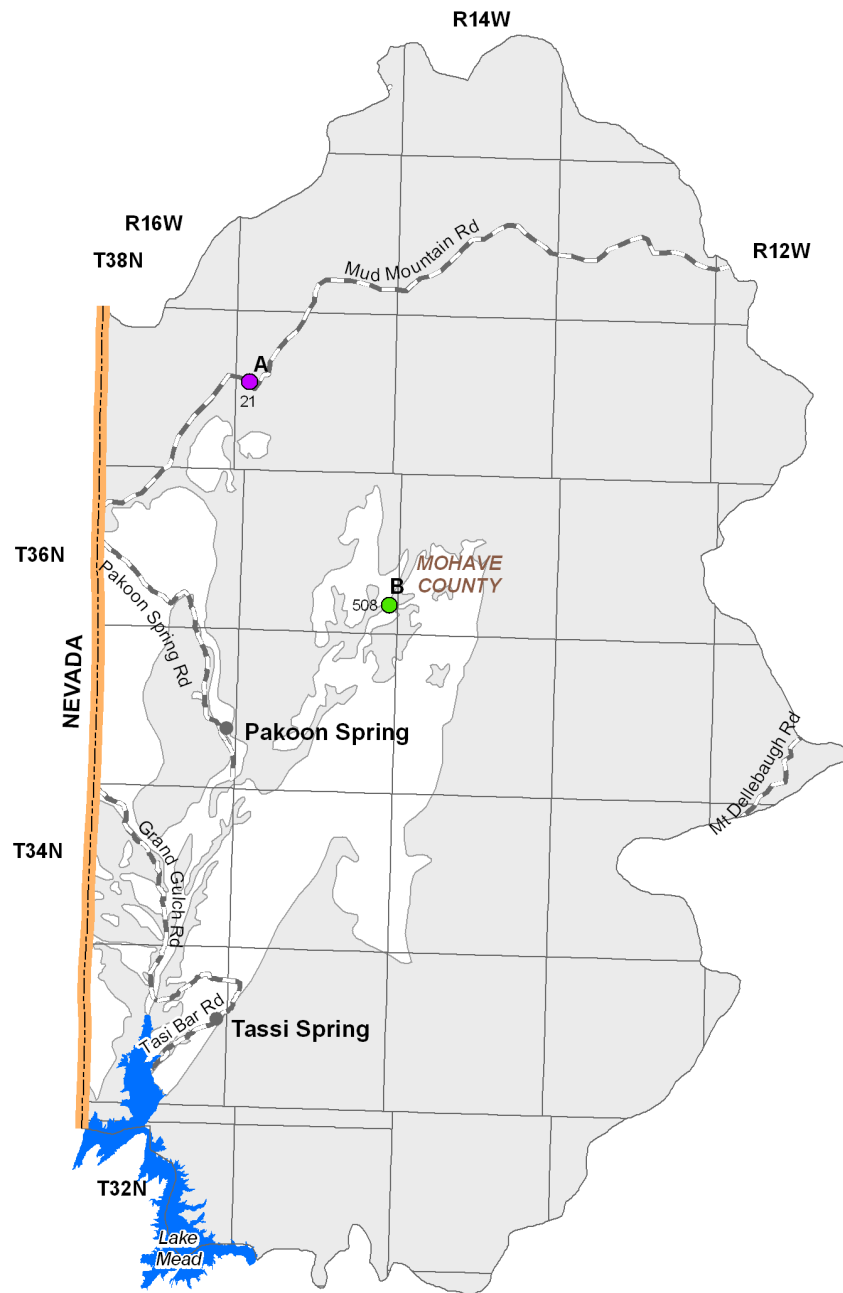


Figure 6.2-6
Grand Wash Basin
Groundwater Conditions

Water-level change in feet between
1990-1991 and 2003-2004

375 H = number is depth to water in feet
during 2003-2004;
letter is hydrograph

Between -1 and +1

Greater than +30

Consolidated Crystalline
& Sedimentary Rocks

Unconsolidated Sediments

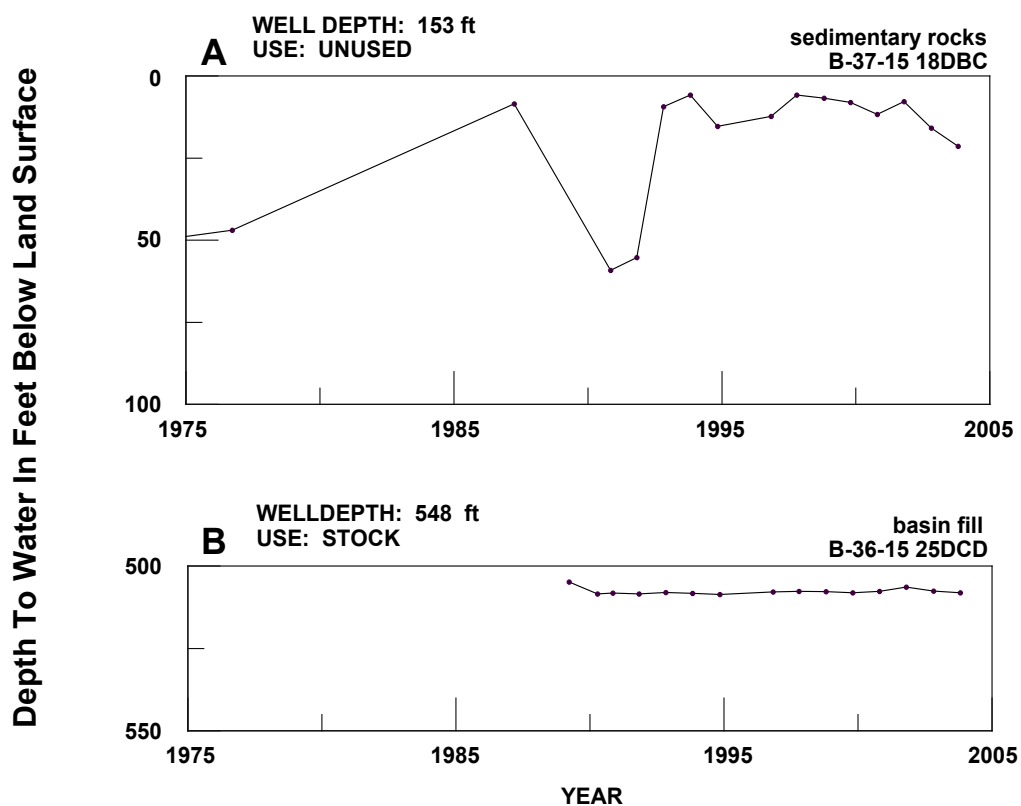
Nevada State Boundary

Major Road

City, Town or Place



Figure 6.2-7
Grand Wash Basin
Hydrographs Showing Depth to Water in Selected Wells



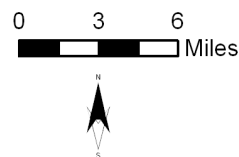
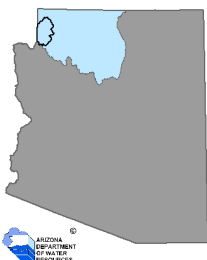
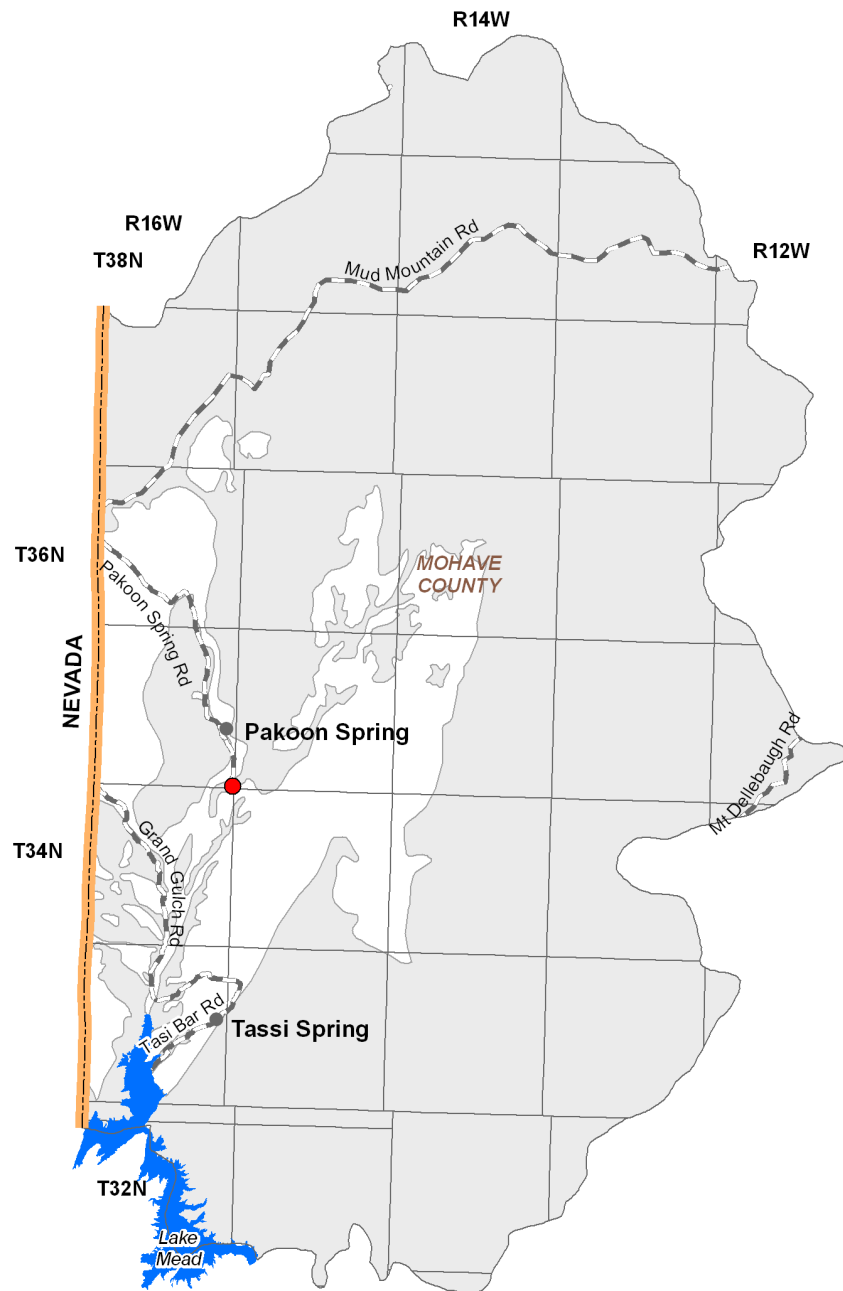


Figure 6.2-8
Grand Wash Basin
Well Yields



6.2.7 Water Quality of the Grand Wash Basin

Wells, springs and mine sites with parameter concentrations that have equaled or exceeded drinking water standard(s), including location and parameter(s) are shown in Table 6.2-7A. There are no impaired lakes and streams in this basin. Figure 6.2-9 shows the location of water quality occurrences keyed to Table 6.2-7. A description of water quality data sources and methods is found in Volume 1, Section 1.3.18. Not all parameters were measured at all sites; selective sampling for particular constituents is common.

Wells, Springs and Mines

- Refer to Table 6.2-7A.
- All seven springs have parameter concentrations of total dissolved solids that have equaled or exceeded drinking water standards.

Table 6.2-7 Water Quality Exceedences in the Grand Wash Basin¹

A. Wells, Springs and Mines

Map Key	Site Type	Site Location			Parameter(s) Concentration has Equaled or Exceeded Drinking Water Standard (DWS) ²
		Township	Range	Section	
1	Spring	38 North	14 West	14	TDS
2	Spring	33 North	15 West	8	TDS
3	Spring	33 North	15 West	9	TDS
4	Spring	33 North	15 West	9	TDS
5	Spring	33 North	15 West	18	TDS
6	Spring	33 North	16 West	3	TDS
7	Spring	33 North	16 West	4	TDS

B. Lakes and Streams

Map Key	Site Type	Site Name	Length of Impaired Stream Reach (in miles)	Area of Impaired Lake (in acres)	Designated Use Standard	Parameter(s) Exceeding Use Standard
None identified by ADWR at this time						

Notes:

¹ Water quality samples collected between 1980 and 2000.

²TDS = Total Dissolved Solids

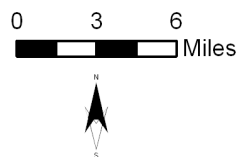
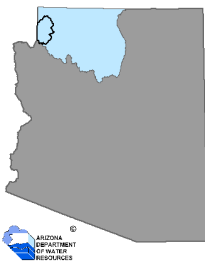
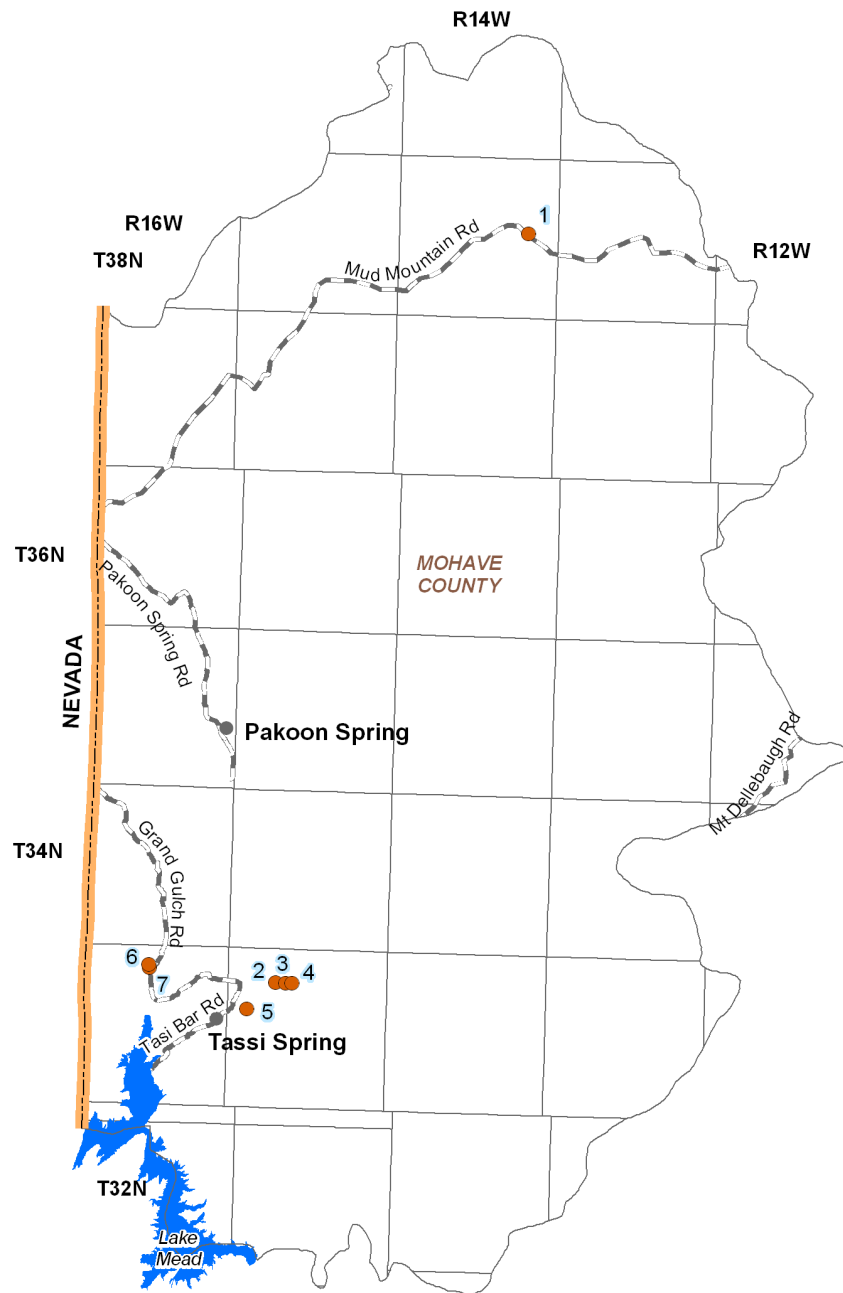


Figure 6.2-9
Grand Wash Basin
Water Quality Conditions

Well, Spring or Mine Site that has
Equalled or Exceeded DWS

Consolidated Crystalline
& Sedimentary Rocks

Unconsolidated Sediments

Nevada State Boundary

Major Road

City, Town or Place



6.2.8 Cultural Water Demands in the Grand Wash Basin

Cultural water demand data including population, number of wells and the average well pumpage and surface water diversions by the municipal, industrial and agricultural sectors are shown in Table 6.2-8. There is no recorded effluent generation in this basin. The USGS National Gap Analysis Program, the primary source of cultural demand map data, showed no demand centers for this basin. A description of cultural water demand data sources and methods is found in Volume 1, Section 1.3.5. More detailed information on cultural water demands is found in Section 5.0.7.

Cultural Water Demands

- Refer to Table 6.2-8
- Population in this basin is very small, with 15 residents in 2000. Projections suggest a small increase in population through 2050.
- There are no recorded surface water uses in this basin. All groundwater use is for municipal demand and has remained relatively constant since 1971.
- As of 2003 there were 12 registered wells with a pumping capacity of less than or equal to 35 gallons per minute and no wells with a pumping capacity of more than 35 gallons per minute.

Table 6.2-8 Cultural Water Demands in the Grand Wash Basin¹

Year	Recent (Census) and Projected (DES) Population	Number of Registered Water Supply Wells Drilled		Average Annual Demand (in acre-feet)						
				Well Pumpage			Surface-Water Diversions			Data Source
		Q ≤ 35 gpm	Q > 35 gpm	Municipal	Industrial	Irrigation	Municipal	Industrial	Irrigation	
1971		9 ²	0 ²	<500			NR			ADWR (1994)
1972										
1973				<500			NR			
1974										
1975										
1976										
1977										
1978				<500			NR			
1979										
1980	10	<500			NR					
1981	10									
1982	10									
1983	11									
1984	11									
1985	11	0	0	<500			NR			
1986	11									
1987	11									
1988	12									
1989	12									
1990	12	2	0	<300	NR	NR	NR			
1991	12									
1992	13									
1993	13									
1994	13									
1995	14	1	0	<300	NR	NR	NR			
1996	14									
1997	14									
1998	14									
1999	15									
2000	15	0	0	<300	NR	NR	NR			
2001	15									
2002	16									
2003	16									
2010	19									
2020	23									
2030	29									
2040	37									
2050	46									

WELL TOTALS: 12 0

¹ Does not include evaporation losses from stockponds and reservoirs.

² Includes all wells through 1980.

NR - Not reported

Table 6.2-9 Effluent Generation in the Grand Wash Basin

Facility Name	Ownership	City/Location Served	Population Served	Volume Treated/Generated (acre-feet)	Disposal Method							Current Treatment Level	Population Not Served	Year of Record
					Water-course	Evaporation Pond	Irrigation	Golf Course	Municipal Reuse	Wildlife Area	Discharged to Another Facility			
No Wastewater Treatment Facilities Identified by ADWR in the Basin														



6.2.9 Water Adequacy Determinations in the Grand Wash Basin

There are no water adequacy applications on file with the Department as of May, 2005 for the Grand Wash Basin. A description of the Water Adequacy Program is found in Volume 1, Appendix A. Adequacy determination data sources and methods are found in Volume 1, Section 1.3.1.

Table 6.2-10. Adequacy Determinations in the Grand Wash Basin

Map Key	Subdivision Name	County	Location			No. of Lots	ADWR File No.	ADWR Adequacy Determination	Reason(s) for Inadequacy Determination	Date of Determination	Water Provider at the Time of Application
			Township	Range	Section						
None identified by ADWR at this time											



Grand Wash Basin

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Index to Section 6.0

Geography	3
Hydrology	
Groundwater Hydrology	7-8
Surface Water Hydrology	15
Environmental Conditions	
Vegetation	21
National Monuments, Wilderness Areas and Preserves	26
Population	29
Water Supply	
Groundwater	35

